Update on Data Analysis

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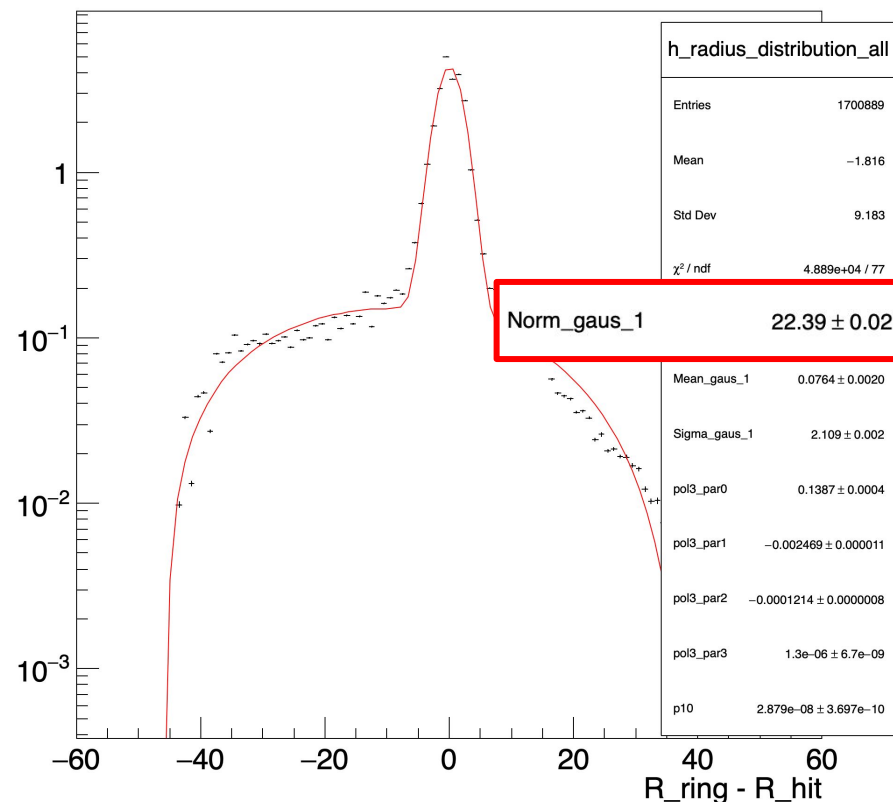13th March 2025

Analysis of N_{\gamma} and SPTR

To check the goodness of the photon yield we explore different approaches to signal extraction and possible things that might impact the measured yield

Recordings of last meeting https://cernbox.cern.ch/s/PZgxL8DCVk8WO54

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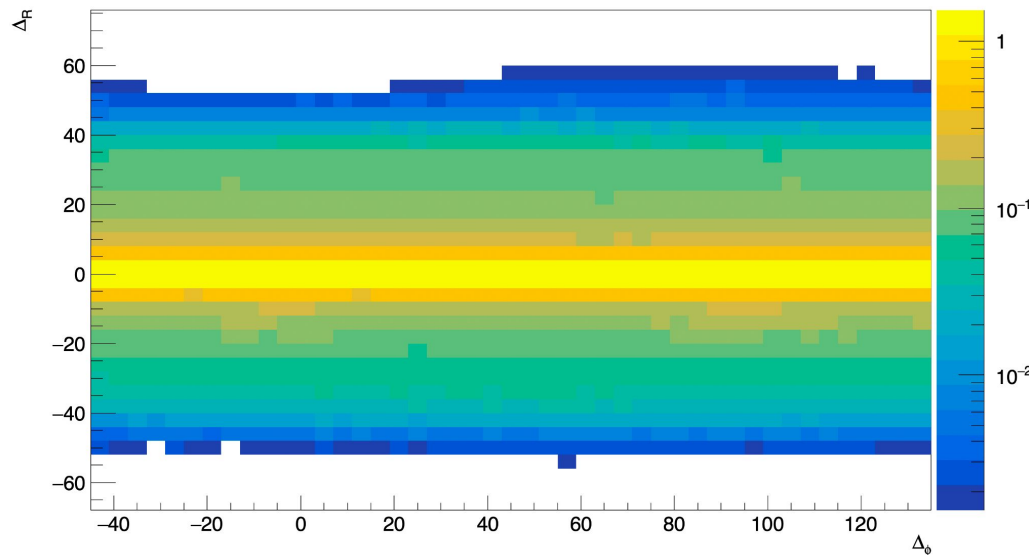
Analysis of N_{\gamma} and SPTR

To check the goodness of the photon yield we explore different approaches to signal extraction and possible things that might impact the measured yield
Indeed I find consistent number of photons

h_radius_distribution_all	
Entries	1700889
Mean	−1.816
Std Dev	9.183
χ^2 / ndf	4.889e+04 / 77
Norm_gaus_1	22.39 ± 0.02
Mean_gaus_1	0.0764 ± 0.0020
Sigma_gaus_1	2.109 ± 0.002
pol3_par0	0.1387 ± 0.0004
pol3_par1	−0.002469 ± 0.000011
pol3_par2	−0.0001214 ± 0.0000008
pol3_par3	1.3e−06 ± 6.7e−09
p10	2.879e−08 ± 3.697e−10

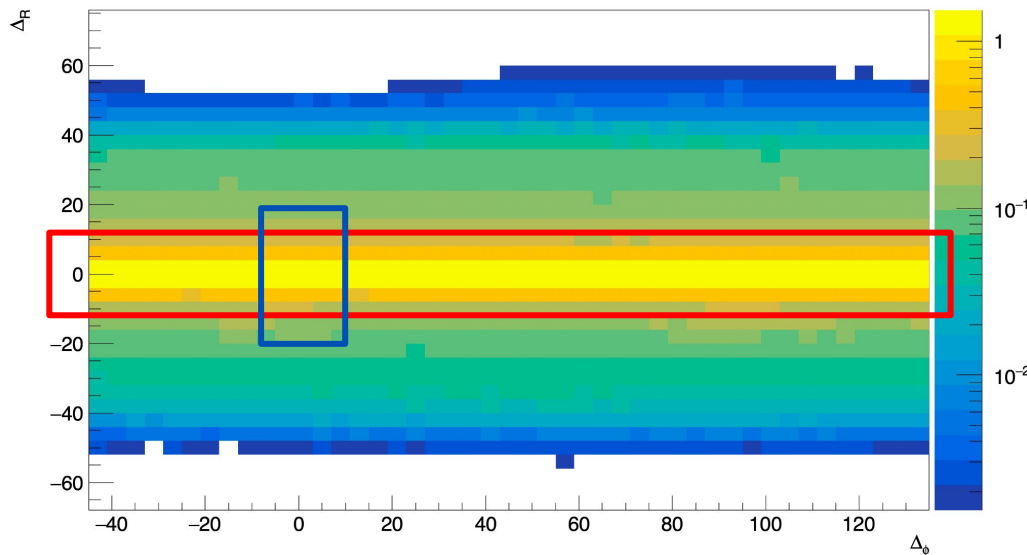# Possible effects altering the signal - Cross-talk

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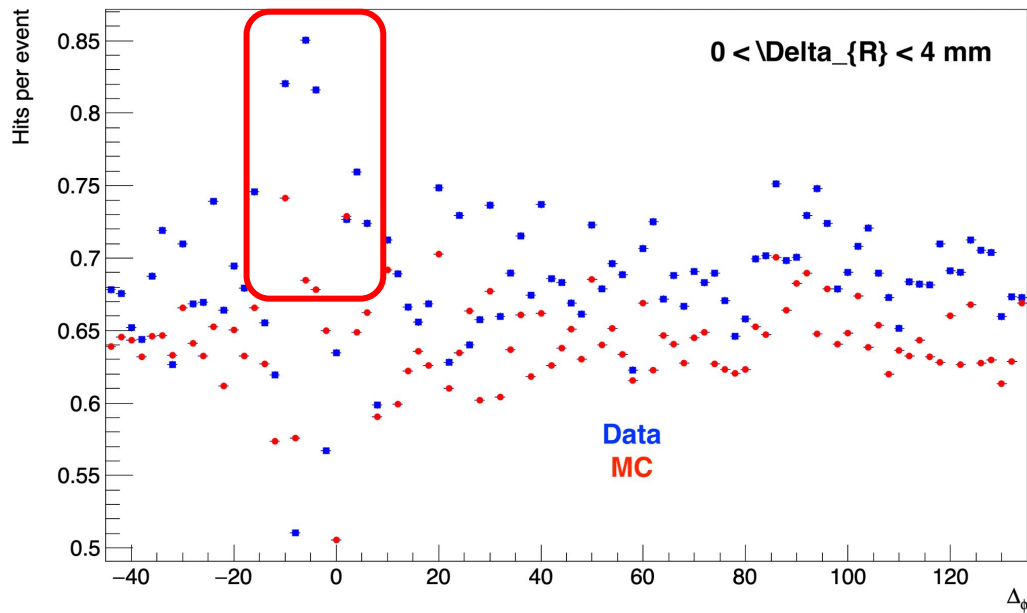
R band at 0 represents our **cherenkov ring** as expected, if we have CT we expect an excess at **\phi 0**

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We also have a fast MC (no CT, AP or Noise) to compare to, where it looks like we have a **small excess** (need to check the normalisation)
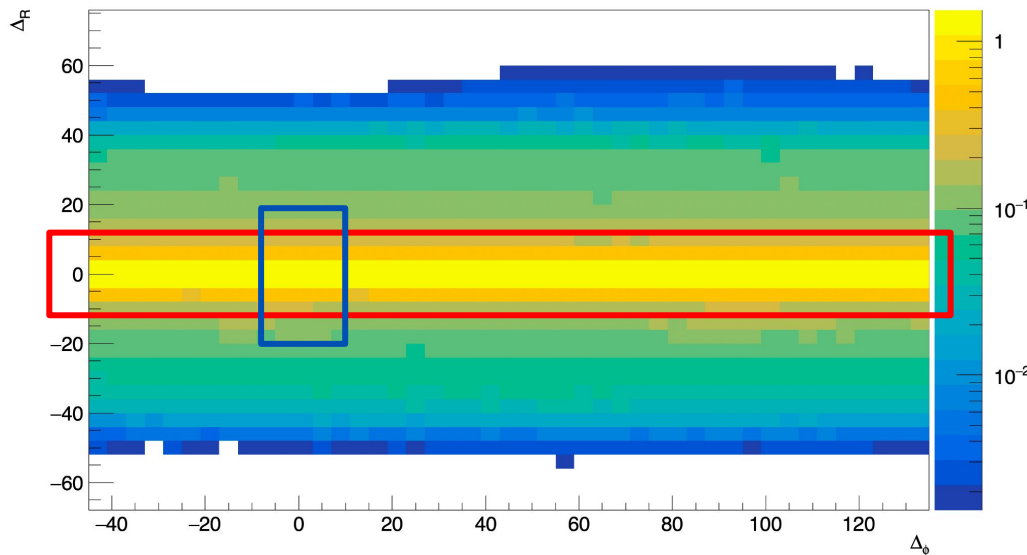
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> Look for correlation in the runs w/o aerogel to highlight CT correlations and suppress the R = 0 band of the cherenkov ring
> Look for correlations in the electronics neighborhood for electrical CT (should not be too different w/ topological ones)

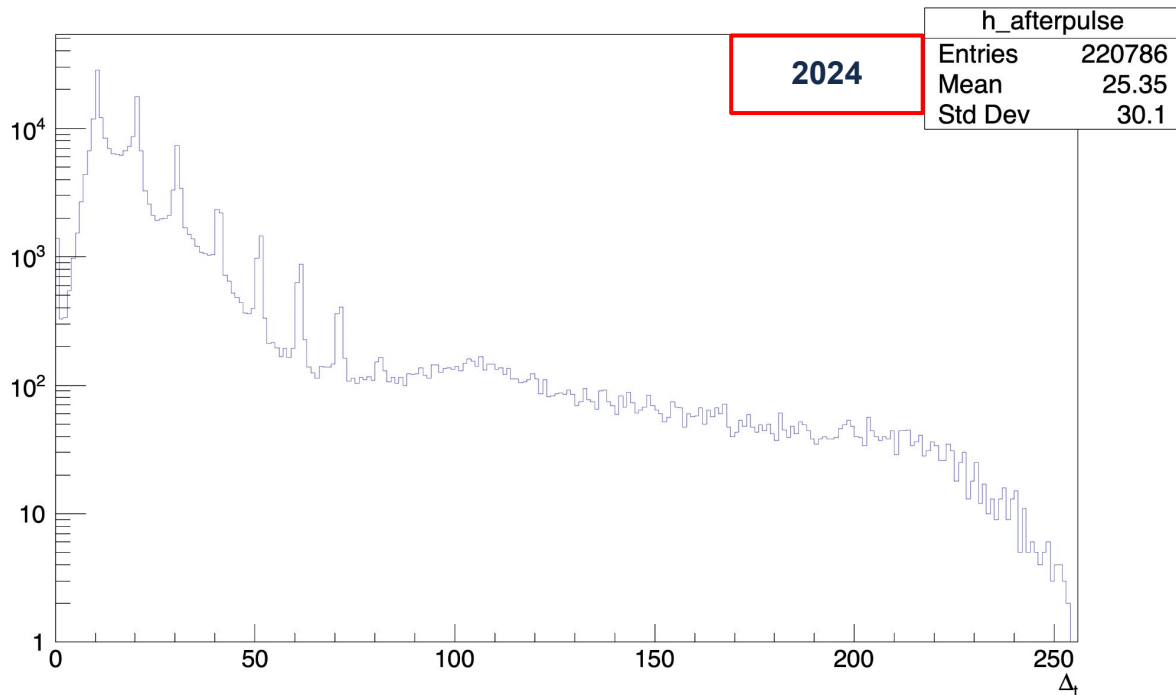# Possible effects altering the signal - After-pulse

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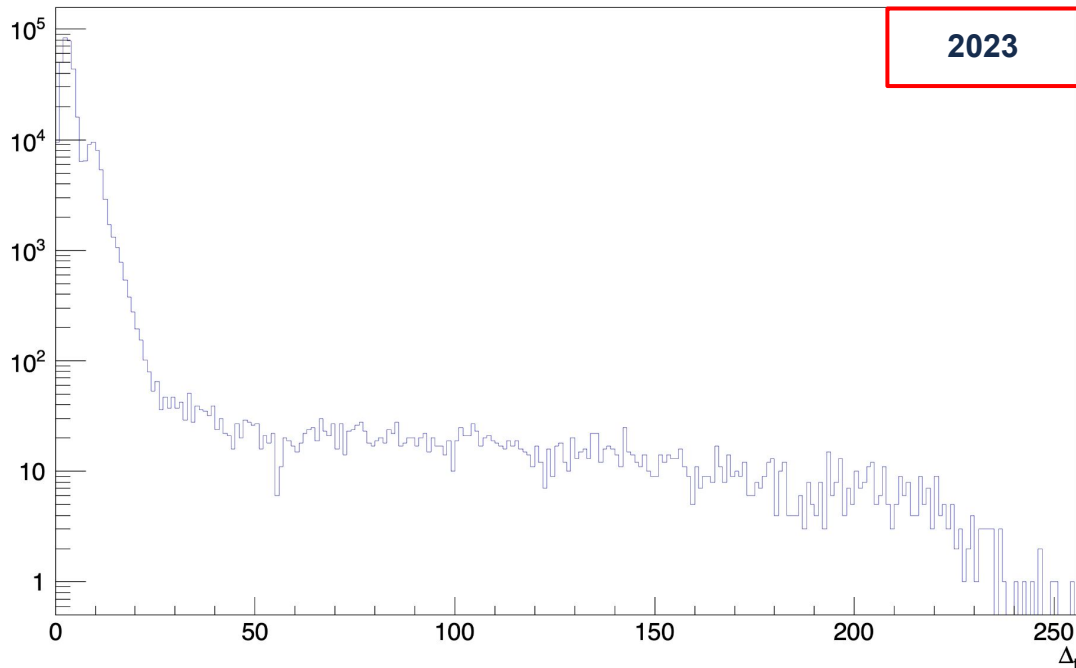
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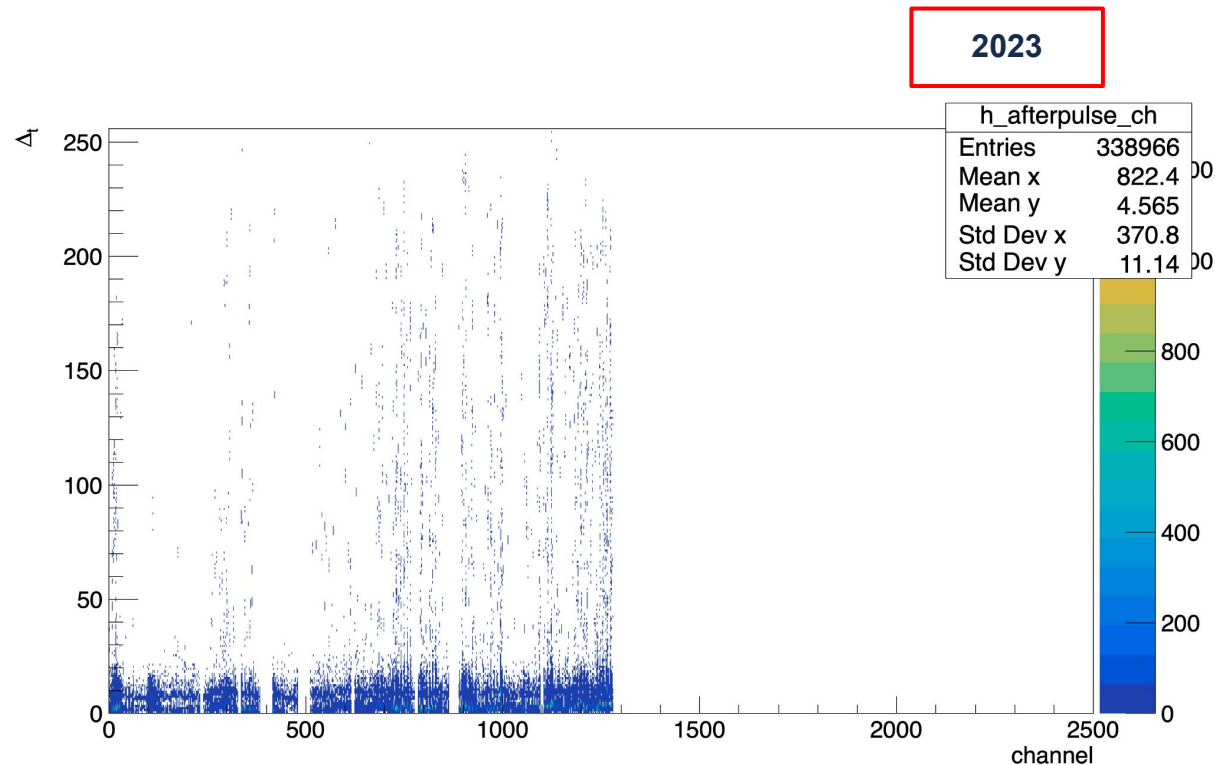We see a noise pattern w/ period of 10 clock cycles in the 2024 data under investigation
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2023

| h_afterpulse_ch	
Entries	338966
Mean x	822.4
Mean y	4.565
Std Dev x	370.8
Std Dev y	11.14

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If we differentiate per channel we see that it's a few noisy channels
The different pattern might be different threshold, sensor, gain etc. modifying the signal ToT

2024

h_afterpulse_ch	
Entries	220786
Mean x	1376
Mean y	25.35
Std Dev x	730.9
Std Dev y	30.1
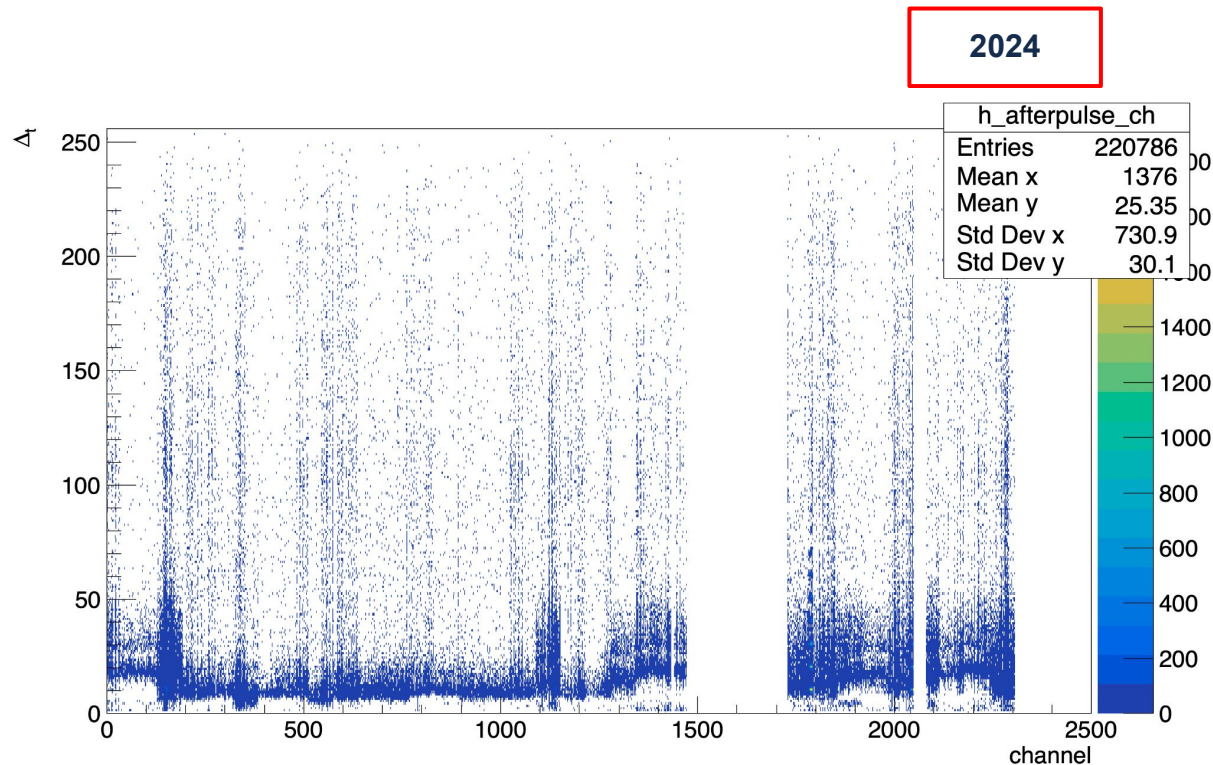
Possible effects altering the signal - Sig-Bkg corr.

To check for possible unrelated Sig-Bkg correlations that might affect the results we try to look at n_sig vs n_bkg
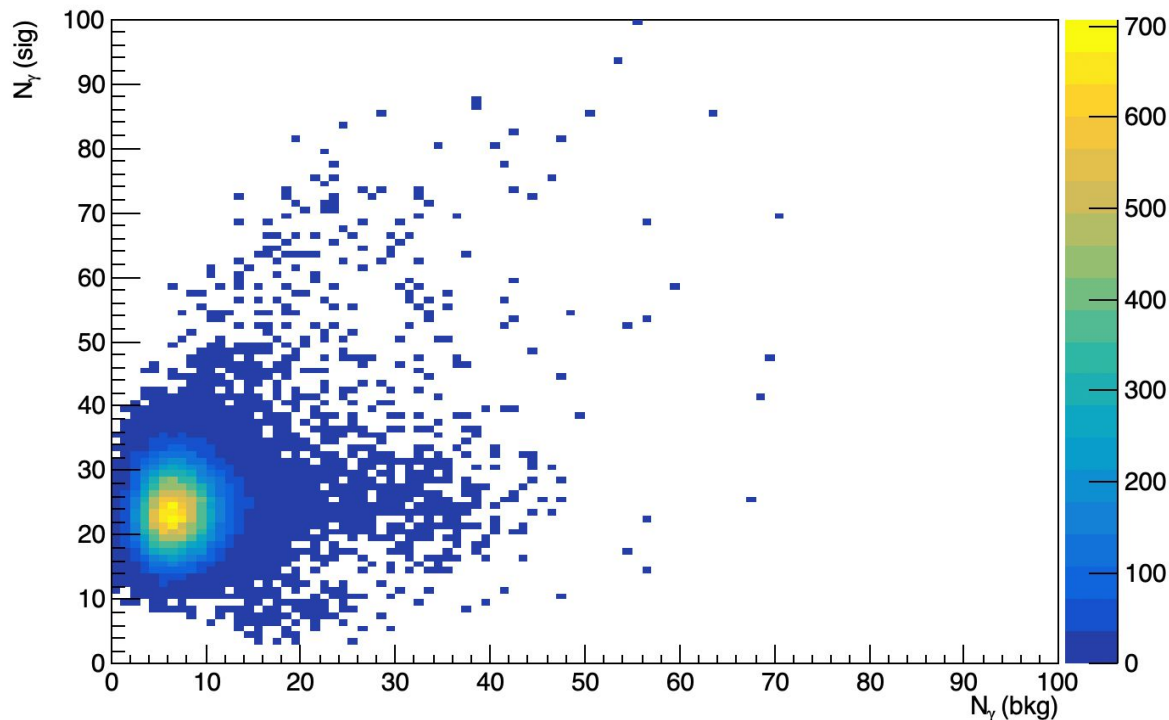
Analysis targets

SPR and Photon yield
[NR][Ongoing]
- Develop a standard approach to systematically and precisely measure SPR and photon yield of cherenkov light

Afterpulse
[AK][Ongoing]
- Develop a standard analysis to measure and/or treat afterpulse impact in data. It's possible to match results with characterisation results.

Cross-talk
[AK][Ongoing]
- Develop a standard analysis to measure and/or treat cross-talk impact in data. It's possible to match results with characterisation results.

Mirror scan
[TBA]
- Develop an analysis to measure and evaluate impact of focusing mirrors on SPR and photon yield

Other investigations

Background
[NR][Ongoing]
- Characterise the bkg and evaluate its impact on the SPR and find source

GEM-available runs
[NR][Stopped][Available]
- Merge GEM and ALCOR data with QA to enhance precision

SiPM Timing
[NR][Stopped][Available]
- Work on ALCOR based timing to minimise time reference in recodata

SiPM Tracking
[NR][Stopped][Available]
- Work on ALCOR based tracking

Thank you!

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Back-up